

REMARKS

Claims 11-30 are currently pending in this application. Newly presented claims 21-23 and 29-30 find basis at page 6, lines 22-25 of the specification. Newly presented claims 24-28 find basis at page 7, lines 18-22 of the specification.

Claims 11-15 and 17-19 stand rejected under 35 U.S.C. § 103(a) as obvious over DD 145540A to Janzen et al. (hereinafter also referred to as “Janzen”). Janzen does not render obvious the present invention.

According to the present invention, the 1st stage of the gas purification of, for example, a DMT-comprising gas is carried out at or below the melting point of, for example, DMT, i.e., butanediol has in every case a temperature about 140°C, since this is the melting point of DMT. Since the gas stream comprises DMT, it is important for the total process to work at or below this melting point in the 1st stage (see page 6, line 6 ff).

From page 7, line 24 ff, it is stated in the present specification that the gas stream is cooled in the 2nd stage but the 2nd stage is carried out above the melting point of the diol, i.e., in the case of butanediol this would be above 19°C, in the case of ethylene glycol or propanediol above -10°C or -32°C, respectively. Since the claim speaks of a process for purifying and cooling gas streams, it can be seen, with simultaneous interpretation of the description and examples, that both process steps are not to be carried out at the same temperature (see also preferred embodiment for DMT and butanediol on page 8, from line 7 ff); first purification, then cooling. This explicitly stated in claim 20.

In the present claims, the choice of words in no way refers (both times) to the melting point of the diol, such that a two step process is clearly shown. Since a two-stage process is claimed, the claimed process is clearly novel over the cited prior art.

A significant improvement of the claimed invention is that DMT can be separated off from a gas stream without formation of industrially very difficult-to-handle DMT solids (desublimates) and the gas stream which has been purified in this way can subsequently be cooled without solids formation. It is achieved industrially by means of appropriate temperature and concentration conditions in the two stages of the process, which cannot be derived from the documents cited.

To further demonstrate the non-obviousness of the present invention, a Declaration by Dr. Loening, one of the named inventors of this application was previously filed. The Declaration shows that single stage scrubbing and cooling of the gas streams according to the prior art has severe technical disadvantages. In the example a) in the Declaration using a temperature of 124°C, the cooling of the gas stream was insufficient and an increase in the loss of 1,4-butadiene from the top of the column occurred. In the example b) in the Declaration using a temperature of 60°C, super saturation of the gas phase with DMT in the column and in the gaseous outlet of the column occurred. The temperatures in the comparative examples were selected since the specific working example in the specification employs 124°C in the first stage and 60°C in the second stage. The Declaration is deemed to be commensurate in scope with the claimed invention, especially when viewed in the context of the cited art.

In Janzen et al., “2 stages” are formally indicated for purification, but the 2nd stage is preferably carried out at 110-130°C (see claim 1); a combination is not encompassed or recommended de facto according to the claimed invention. Even assuming *arguendo* if 2 different stages are indicated, this “2nd stage” is in no way technically comparable to the claimed process step. According to the present invention as recited in claim 11, the second stage is carried out at a temperature of 20 to 80°C, which differs significantly from the range of 110-130°C.

Further, in Janzen et al., a gas is pushed through a liquid (see figure), which leads to an extreme pressure drop (is not technically comparable to “quenching”). Even if the liquid were here to reach the indicated 20°C, the contact time is not sufficient to cool the gas due to the circumstances of the apparatus. If appropriately long contact times were to be employed, cooling would still not be appreciable and the mode of operation would also become uneconomical.

On entering this stage, a tremendous pressure drop occurs (from a gauge pressure 500 mbar to ambient pressure on exit). Downstream of this, the stock tank would have to be designed appropriately for 1013 + 500 mbar gauge pressure, i.e. about 2 bar. However, this would lead to an increase in the thickness, larger pumps, etc. In summary, these lower limits cannot be achieved technically using the apparatus and mode of operation described in Janzen et al.

Correspondingly, it is also stated on page 2 of Janzen et al. that (last 4 lines, middle

paragraph) an additional discharge (water separator) is required because of entrained volatile components.

Claim 16 is rejected as obvious over Janzen et al. in view of US Patent Application Publication No. 2003/0114062 to Scott. The cited references do not render obvious claim 16. Scott does not overcome the deficiencies of Janzen with respect to rendering unpatentable the present invention. Scott was relied upon for a disclosure of 1,4-butanediol. Accordingly, claim 16 is patentable for at least those reasons as to why claim 11 is patentable.

Furthermore, Scott merely mentions that 1,4 butanediol is used to prepare polybutylene terephthalate. Scott is not concerned with purifying and cooling a gas stream and therefore is not at all relevant to the present invention. Persons skilled in the art would not look to Scott to modify the process of Janzen et al.

Claims 11-20 are rejected under 35 U.S.C. § 103(a) as being obvious over US Patent No. 6,312,503 to Fike et al. (hereinafter also referred to as "Fike"). Fike does not render obvious the present invention.

As appreciated by the examiner, Fike does not disclose a temperature range of 20°C to 80°C for a second stage as employed according to the present invention. Instead, the use of 8°C is relied upon in the office action along with the unsupported conclusion that 20°C to 80°C. The claimed range vastly differs from that used by Fike. Fike does not at all suggest that this temperature could be or should be modified to be within the claimed range and that the results achievable by the present invention would have been obtained.

Moreover, although Fike describes a multistage process, the process fundamentally differs in principle and thus has clear disadvantages compared to the claimed process. For instance; whereas, in the present invention, the first stage for removal of the ester from the gas phase is achieved by means of a gas scrub and the gas is subsequently cooled by means of a cold liquid (quenching) in a second stage, in Fike, the gas is firstly cooled at very low temperatures and the ester is then scrubbed out. Here, aerosol/mist formation is to be expected in the first stage due to the tendency of the system to desublime in the present case of DMT; this is avoided in a targeted manner by means of the present invention, i.e. no desublimation occurs.

Moreover, in Fike, the temperature is at no point in the vicinity of the melting point of DMT and this document also gives no suggestion of a combined mode of operation.

Claim 16 is rejected as obvious over Fike in view of US Patent Application Publication No. 2003/0114062 to Scott. The cited references do not render obvious claim 16. Scott does not overcome the deficiencies of Fike with respect to rendering unpatentable the present invention. Scott was relied upon for a disclosure of 1,4-butanediol. Accordingly, claim 16 is patentable for at least those reasons as to why claim 11 is patentable.

Furthermore, Scott merely mentions that 1,4 butanediol is used to prepare polybutylene terephthalate. Scott is not concerned with purifying and cooling a gas stream and therefore is not at all relevant to the present invention. Persons skilled in the art would not look to Scott to modify the process of Fike.

As the table below shows, the cited documents disclose either only cooling using other scrubbing media or purification. Applicants note that it is relevant to the subsequent discussion of the inventive step that the prior art all either cools or purifies, i.e., never describes a combination of these two modes of operation.

Document/ Patent	Scrubbing medium	Apparatus	Remarks	Mentioned in application - Differentiation
DD 145540 Janzen et al.	Glycol	Chamber vessel with bubble column + scrubber multistage	Storage of molten DMT, glycol used as scrubbing and barrier liquid, recirculation of DMT to process	Page 2, lines 20-32 *no cooling described *high pressure drop due to barrier liquid
US 6312503 Fike et al.	Ethylene glycol	Countercurrent scrubber, multistage	Stripping of gas streams from PET reactor, gas stream comprising monomers + second reaction components, lower apparatus section = gas cooling, upper apparatus section = gas scrub, no DMT in the	Page 3, lines 4- 18 *only cooling *principle incorrectly described *no recovery of

			offgas mentioned	material of value
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Overall, some “multistage” work-ups are mentioned, but either only cooling or only scrubbing is carried out. In the case of “only cooling”, sublimate formation occurs. In the case of “only scrubbing”, hot off gas (not permissible) is formed, there is a very high gaseous output and DMT is lost in relatively large amounts.

As such, in view of the several differences and deficiencies, claims 11-19 are clearly novel and unobvious over the above-cited documents, alone or in combination. Therefore, reconsideration and withdrawal of the rejections are requested.

In conjunction with interpreting 35 U.S.C. §103 under *Graham V. John Deere*, 383 U.S. 1, 148 U.S.P.Q. 459 (1966) and *KSR Int’l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 (2007), the initial burden is on the Patent Office to provide some apparent reason or suggestion of the desirability of doing what the inventor did, i.e. the Patent Office must establish a *prima facie* case of obviousness. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention, or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. Moreover, MPEP, § 706.02(j), states that "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. Also, please see *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). This has not been done in the present case.

In addition, the prior art reference (or references, when combined) must teach or suggest all of the claim limitations. The cited references do not disclose the temperature range of 20°C to 80°C as recited in claim 11 and claims depended therefrom.

The mere fact that cited art may be modified in the manner suggested in the Office Action does not make this modification obvious, unless the cited art suggests the desirability of

the modification or impliedly suggests the claimed invention, or the Examiner has presented a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. No such suggestion appears in the cited art in this matter nor has a convincing line of reasoning been presented in this case. The Examiner's attention is kindly directed to *KSR Int'l Co. v. Teleflex, Inc.*, supra; *In re Dembiczak et al.*, 50 USPQ2d.1614 (Fed. Cir. 1999), *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984), *In re Laskowski*, 10 USPQ2d, 1397 (Fed. Cir. 1989) and *In re Fritch*, 23, USPQ2d. 1780 (Fed. Cir. 1992).

Furthermore, the cited art lacks the necessary direction or incentive to those of ordinary skill in the art to render a rejection under 35 USC 103 sustainable. The cited art fails to provide the degree of predictability of success of achieving the results or properties attained by the present invention needed to have a rejection under 35 U.S.C. 103 sustained. See *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 (2007), *Diversitech Corp. v. Century Steps, Inc.*, 7 USPQ2d 1315 (Fed. Cir. 1988), *In re Mercier*, 187 USPQ 774 (CCPA 1975) and *In re Naylor*, 152 USPQ 106 (CCPA 1966).

Moreover, the results or effects of the subject matter and improvements which are inherent in the claimed subject matter and disclosed in the specification are to be considered when evaluating the question of obviousness under 35 USC 103. See *KSR Int'l Co. v. Teleflex*, supra, *In re Sullivan*, 498 F. 3d 1345 (Fed. Cir. 2007), *Gillette Co. v. S.C. Johnson & Son, Inc.*, 16 USPQ2d 1923 (Fed. Cir. 1990), *In re Antonie*, 195 USPQ 6 (CCPA 1977), *In re Estes*, 164 USPQ 519 (CCPA 1970), and *In re Papesch*, 137 USPQ 43 (CCPA 1963).

No property or effect can be ignored in determining patentability and comparing the claimed invention to the prior art. Along these lines, see *In re Sullivan*, supra, *In re Papesch*, supra, *In re Burt et al.*, 148 USPQ 548 (CCPA 1966), *In re Ward*, 141 USPQ 227 (CCPA 1964), and *In re Cescon*, 177 USPQ 264 (CCPA 1973).

In view of the above remarks, Applicants believe the pending application is in condition for allowance.

In the event the Examiner believes that another interview might serve in any way to advance the prosecution, the undersigned is available at the telephone number noted below.

The Commissioner is hereby authorized in this paper to charge payment or credit any overpayment to Deposit Account No. 03-2775, under Order No. 12810-00347-US from which the undersigned is authorized to draw.

Dated: December 16, 2010

Respectfully submitted,

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